Alpha, Beta, and Now… Gamma

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Morningstar Investment Management
Alpha, Beta, and Now…Gamma
Different Types of Gamma

- Total Wealth Asset Allocation
- Dynamic Withdrawal Strategy
- Annuity Allocation
- Asset Location and Withdrawal Sourcing
- Liability Relative Optimization
The remaining non-annuity portfolio now has a 60% equity allocation; however, the total wealth allocation from an income perspective, after considering the Single Premium Immediate Annuity (SPIA), is still 45% equities.

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Dynamic Withdrawal Strategy

**Traditional Approach**

1. Determine Withdrawal Amount Retirement
   - The 4% rule
2. Withdrawal Annually
   - Accounting for Inflation

**Our Approach**

1. Determine Retirement Period
2. Determine Portfolio Equity Allocation
3. Determine Withdrawal Percentage for a Given Target
4. Repeat Annually

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Annuity Allocation: What do Retirees Fear More?

Outliving Their Retirement Money 61%

Asset Allocation and Withdrawal Sourcing

Inefficient Asset Location

- **Bonds**
  - Taxable Account
  - 401(k) Account
- **Stocks**

Efficient Asset Location

- **Bonds**
  - 401(k) Account
  - Taxable Account
- **Stocks**

For illustration purposes only.
Liability Relative Optimization

<table>
<thead>
<tr>
<th>Asset-only Approach</th>
<th>Value of Liabilities vs Value of Assets</th>
<th>Portfolio Health/Funding Costs</th>
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<td><img src="#" alt="Graph" /></td>
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Total Wealth Asset Allocation
Individual Portfolio Assignment

Financial Capital

► Tradable assets such as stocks and bonds have traditionally been used when constructing an asset allocation
► Incomplete without considering Human Capital
► An individual’s ability to earn and save
► Present value of all your expected future wages including pension and social securities

For illustration purposes only.
Life Cycle of Human Capital and Financial Capital

Human Capital
An individual’s ability to earn and save

Financial Capital
An individual’s total saved assets

For illustration purposes only.
Targeting the Market Portfolio

Human Capital
Bond 70%

Financial Capital

Market Portfolio
Stock 45%

Total Economic Wealth

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Dynamic Withdrawal Strategy
A Balancing Act

Retirement Income

More

Less

65 90

Age
Defining “Failure” for a Retiree

► You can achieve 99% of your goal and still “fail”

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Change Is a Good Thing

Bull Market

Bear Market

4% Static Initial Withdrawal
Dynamic Withdrawal Strategy

Annual Income
$200k
$160k
$120k
$80k
$40k
$0k

Years into Retirement
1 5 10 15 20 25

1 5 10 15 20 25
Better Outcomes

1. Determine Retirement Period
2. Determine Portfolio Equity Allocation
3. Determine Withdrawal Percentage for a Given Target
4. Repeat Annually

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Annuities
Who Cares About Lifetime Income?

Your Client?
Inefficient Retirement Planning

Defined Benefit Plans

401(k) Plans
Do You Feel Lucky?
Using Utility to Estimate Retiree Preferences

- Goal is to maximize the total income replaced during retirement
- Excess income is good, but a shortfall is penalized more
Retirement Income Efficient Frontier

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Incorporating Guaranteed Income

Research published in CFA Institute Monograph

Award-winning paper on the integration of human capital and asset allocation

Research paper focused on a methodology reflecting the features of variable annuities with GMWB for life
Determining Asset Allocation with Annuities

Collect Inputs

- Human Capital
- Financial Capital and Current Savings
- Life Insurance Annuities

Determine Asset Allocations

- Traditional Funds, ETF’s
- Life Insurance/Annuities

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Asset Location and Withdrawal Sourcing
The Importance of Taxes

Analysis assumes a 35% tax rate, where taxes are paid annually in the taxable account, but not until the end of the period in the Traditional IRA.
# Asset Allocation and Withdrawal Sourcing

<table>
<thead>
<tr>
<th>Inefficient</th>
<th>Moderate</th>
<th>Efficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocating and Withdrawing Stock from IRA First.</td>
<td>Allocating Stocks to Taxable Account and Withdrawing From IRA First</td>
<td>Allocating and Withdrawing Stocks From Taxable Account</td>
</tr>
</tbody>
</table>

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Liability Relative Optimization
What is Portfolio Risk?

What is the TRUE risk for a portfolio that exists to fund (pay for) a liability?

► It is NOT the standard deviation of the asset portfolio
► It is NOT the performance of your asset portfolio relative to the asset portfolios of your peers
► The TRUE risk is that it won’t be able to pay for the liability!
Improving Portfolio Health

Value of Liabilities vs. Value of Assets

Asset-only Approach

Value of Assets

Value of Liabilities

Time

Portfolio Health/Funding Costs

Liability-relative Approach

Value of Assets

Value of Liabilities

Portfolio Health

Time
What is Surplus Optimization?

► A special case (or extension) traditional mean-variance optimization in which the optimizer is constrained to hold a combination of assets representing the liability short

► One element of broader approach called liability-relative investing or asset-liability management (ALM), which can include 1) duration matching (a.k.a. immunization), 2) convexity matching, and 3) cash flow matching

► Focuses on the entire portfolio—assets and liabilities—not just the assets of a portfolio
Surplus optimization considers both the amount and investment characteristics of the liability (funding ratio).

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Different Portfolios

Liability Relative Optimization

Asset-Only Optimization

For illustration purposes only.
## Return and Risk Impact

<table>
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<tr>
<th>Scenario One: Standard</th>
<th>Scenario Two: Surplus</th>
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<tr>
<td>Return</td>
<td>Risk</td>
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<td>6.00</td>
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<tr>
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Source: “Alpha, Beta, and Now... Gamma” by David Blanchett and Paul D. Kaplan, Morningstar White Paper
More Consistent Success Rates

- Probability of Success

Inflation

- Low
- Low/Mid
- Mid
- Mid/High
- High

Source: “Alpha, Beta, and Now... Gamma” by David Blanchett and Paul D. Kaplan, Morningstar White Paper
Morningstar’s 3x3 Liability-Relative Approach

Over 500 portfolios created for each plan

Equity Allocation

30 Years Until Retirement

0% 10% 97%

3A

2A

A Accumulation
D Distribution
CP Client Portfolio

Retirement

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Results
Why Does Gamma Matter?

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Source: “Alpha, Beta, and Now…Gamma” by David Blanchett and Paul D. Kaplan, Morningstar White Paper
Potentially More Income with Gamma Optimization

+28.8% in retirement income is equivalent to a return increase of +1.82% (i.e. ”Gamma equivalent alpha”)

For illustration purposes only. Please see slide 46 for important disclosures.

Source: “Alpha, Beta, and Now… Gamma” by David Blanchett and Paul D. Kaplan, Morningstar White Paper
Potentially More Income with Gamma Optimization

Optimal social security benefit claiming can increase income by 9.15%, which creates equivalent alpha” of +74%

For illustration purposes only. Please see slide 46 for important disclosures.
Source: “Alpha, Beta, and Now…Gamma” by David Blanchett and Paul D. Kaplan, Morningstar White Paper
Conclusions

► Value is more than Alpha and Beta
► Creating retirement income from a portfolio is complicated
► There are a number of different risks that need to be considered when building an “optimal” retirement income portfolio
► An optimized retirement income plan (i.e., Gamma-optimized) can potentially generate 29% more retirement income than a naïve approach based on our initial research and potentially 38% more income for a hypothetical retiree when adding social security

For illustration purposes only. Please see slide 46 for important disclosures.
► This creates “Gamma equivalent alpha” of 1.82% or 2.15%, respectively
Methodology
Calculating Gamma

Gamma is the utility-adjusted income generated by the Gamma-optimized portfolio, which we donate as $II$

We define $II$ as the constant payment amount that a retiree would accept such that his or her utility would equal the utility of the actual income path realized on a given simulation path.

$$II = \left( \frac{\sum_{t=0}^{T} q_t (1 + \rho)^{-t} I_t^\eta}{\sum_{t=0}^{T} q_t (1 + \rho)^{-t}} \right)^{\frac{\eta}{\eta-1}}$$

This is given by
There are two preference parameters ($\rho$ and $\tau$) that describe how the investor feels about having income to consume at different points in time, with no reference to risk.

Following the approach in Epstein and Zin (1989), we treat the elasticity of substitution as a parameter distant from the risk tolerance parameter. We introduce the risk tolerance parameter ($\theta$) next by treating the path as unknown and evaluating expected utility:

$$EU = \sum_{i=1}^{M} p_i \left( \frac{\theta}{\theta - 1} \right)^{\theta - 1}$$

- $\theta$ = risk tolerance parameter (.333)
- $M$ = number of paths
- $i$ = which of M paths is being referred to
- $p_i$ = the probability of path i occurring which we set to $1/M$. 

Calculating Gamma
Calculating Gamma

We define $Y$ as the constant value for $II$ that we yield this level of expected utility. This is given by

$$Y = \left[ \sum_{i=1}^{M} p_i (II_i) \frac{\theta}{\theta-1} \right]^{\frac{\theta}{\theta-1}}$$

We can now formally define the Gamma of a given strategy or set of decisions as

$$\text{Gamma (Strategy)} = \frac{Y (\text{Strategy}) - Y (\text{Benchmark})}{Y (\text{Benchmark})}$$
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